SLGEI

State of Michigan
School & Local Government
Energy Initiative

Introductory Energy Evaluation

Bedford Falls Public Schools
Bedford Falls, Michigan

Submitted by:

Kevin B. Cook
Energy Management Consultant

G-ENERGY
PO Box 848
Jenison MI 49429
(888) 457-6622

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Executive Summary

From the results of this Introductory Energy Evaluation, a Technical Energy Analysis (TEA) is recommended as your next step. Among the listed energy conservation opportunities (ECOs), there are lighting upgrades, timers and controls measures that appear to be cost-effective; heating and water heating system replacements, window improvements and energy management systems may also be cost-effective. A professional engineer can best determine the cost, savings and payback for any number or combination of ECOs through a Comprehensive Technical Energy Analysis (CTEA).

Assistance in hiring a qualified engineering firm to conduct a TEA and arranging the funding for the implementation of ECOs is available under the SLGEI program. The State of Michigan's Department of Consumer & Industry Services - Energy Resources Division will monitor the entire process from beginning to end, as well as the utility bills for one year after the ECOs are installed to account for the actual energy savings achieved. Troubleshooting will also be provided if savings are lower than expected. The SLGEI program can be a tremendous asset in helping you lower energy use and save money at your school facilities.

Summary of Energy Conservation Opportunities

Energy Conservation Opportunity (ECO)	Applicable Building	ECO Additional Benefits
1) **T8 Fluorescent Lighting (with electronic ballasts)** Replace/retrofit standard T12 fluorescent light fixtures with T8 fluorescent fixtures. A minimum savings of 30% on lighting could be achieved.	Elementary Middle / High School	Eliminate eyestrain; can raise lighting levels in some cases; improve student performance.
2) **LED Exit Sign Lighting** Replace incandescent exit signs with LED units. LED retrofit lamps can be used in some fixtures, others will need to be replaced with LED exit sign fixtures. Over 90% savings can be achieved on exit sign lighting.	Elementary Middle / High School	Reduce maintenance: LED exit signs and retrofit lamps have 20-year life cycles.
3) **High Efficiency HID Exterior Lighting** Replace mercury vapor fixtures with high pressure sodium fixtures to save 35% on exterior lighting.	Elementary Middle / High School	Increase the lighting level in some cases.
4) **Compact Fluorescent Lamps (CFLs)** Replace incandescent lighting with compact fluorescent lamps.	Elementary Middle / High School	Reduce maintenance.
5) **Pulse-Start Metal Halide Lighting** Replace or retrofit gymnasium light fixtures with pulse-start metal halide lighting.	Middle / High School	Improve lighting color.
6) **Water Heating System Replacements** Consider replacement of water heating systems with smaller modular systems -- smaller high efficiency (85%+) boilers coupled with *properly* sized storage tanks and coils.	Elementary Middle / High School	
7) **Timers for Water Heating Circulator Pumps** Install timer on circulator pump to shut off water heating loop during unoccupied building hours.	Elementary Middle / High School	Reduce pump motor maintenance.
8) **Water Conservation** Install low flow kits in toilet and urinal flush valves to save 20-50%.	Elementary Middle / High School	
9) **Steam Trap Maintenance** Continue to inspect and repair/replace any faulty steam traps in boiler system.	Elementary Middle / High School	Improve comfort and heating system control.
10) **Tune/Calibrate or Replace Pneumatic System** Inspect and tune/calibrate pneumatic temperature control system.	Elementary Middle / High School	Improve comfort, heating control, air quality and ventilation.
11) **Energy Management System** Consider installation of direct digital control (DDC) energy management system and implementation of day-night temperature settings.	Elementary Middle / High School	
12) **Steam Boiler Replacement** Consider replacement of old steam boilers with high efficiency steam boiler systems.	Elementary Middle / High School	

Continued on next page

Energy Conservation Opportunity (ECO)	Applicable Building	ECO Additional Benefits
13) Upgrade Single-Pane Windows There are single-pane window areas that could be reduced or replaced. Overglazing or an insulated wall finish can be installed around smaller, energy-efficient windows. An excellent alternative for classrooms would be moveable insulation (snuffer panels) to maintain natural lighting during school hours and save energy during unoccupied hours.	Elementary Middle / High School	Improve comfort.
14) Upgrade Pop Machines Disconnect lamps and ballasts inside all pop machines.	Elementary Middle / High School	Reduce pop machine cooling load.
15) Drinking Fountain Timers Install 24-hour timers on all *plug-in* drinking fountains to shut them off during unoccupied building hours.	Elementary Middle / High School	Extend compressor life.
16) ENERGY STAR Computers & Power-Down Feature Check your computers to make sure the power-down feature is activated. Specify new computer equipment with U.S. EPA ENERGY STAR rating.	Elementary Middle / High School	
* **Roof Insulation** When roof replacement is due, be sure to specify at least two-inches rigid foam insulation to be added… any *additional* cost will be recovered in energy savings.	Elementary Middle / High School	Improve comfort.
* **Premium Efficiency Motors** When replacing pump, air handler fan or other motors, be sure to specify premium efficiency motors… any additional cost will be recovered in energy savings.	Elementary Middle / High School	Improve power quality.

* ***ECO for future consideration when replacement is necessary.***

Building Profiles

On January 1, 2001 a site visit was made to Bedford Falls Area Schools to identify opportunities for reducing energy consumption and costs in the (3) buildings summarized below. The study was also made to assess the need for a further engineering study under the School & Local Government Energy Initiative (SLGEI) program. At each site, a visual inspection of mechanical equipment, HVAC systems, temperature controls and lighting was performed.

Bedford Falls Elementary
Built in 1900, the building is heated by a large natural gas steam boiler. Building temperature is controlled by pneumatic thermostats. Domestic hot water is provided by a large natural gas modular system with a 500-gallon storage tank. Windows are single-pane glass. Interior lighting is fluorescent and incandescent; exterior lighting is mercury vapor. A commercial kitchen (used daily for lunches) is on site.

Bedford Falls Middle / High School
Built in 1910, the building is heated by a large natural gas steam boiler. Building temperature is controlled by pneumatic thermostats. Water heating is provided by a large natural gas modular system with a 1000-gallon storage tank. Windows are single-pane glass. Interior lighting is fluorescent and incandescent; exterior lighting is mercury vapor. The building has a commercial kitchen used daily.

Many thanks to George Bailey for providing a very informative tour of the above facilities. His knowledge of building operations and the improvements made over the years was invaluable in putting together this report.

Energy Use Analysis

The total cost of energy over the past year at the (2) Bedford Falls Public School buildings included in this report was $158,394. Electricity accounted for 60% of the total cost at $95,773. Natural gas was responsible for the remaining 40% of the total at $62,621.

Using monthly utility bills for the past year, the Energy Utilization Index in Btu per square foot (Btu/sq.ft.) per year was calculated for each school to compare the energy use to other Michigan schools. Figure 1 on the next page shows a graph of the schools' EUI compared to the average energy use for public school buildings (the average for Michigan schools is approximately 90,000 Btu/sq.ft. per year). The energy use in Btu/sq.ft. per year for each building was broken down into natural gas energy use (yellow bar on graph) and electricity energy use (blue bar).

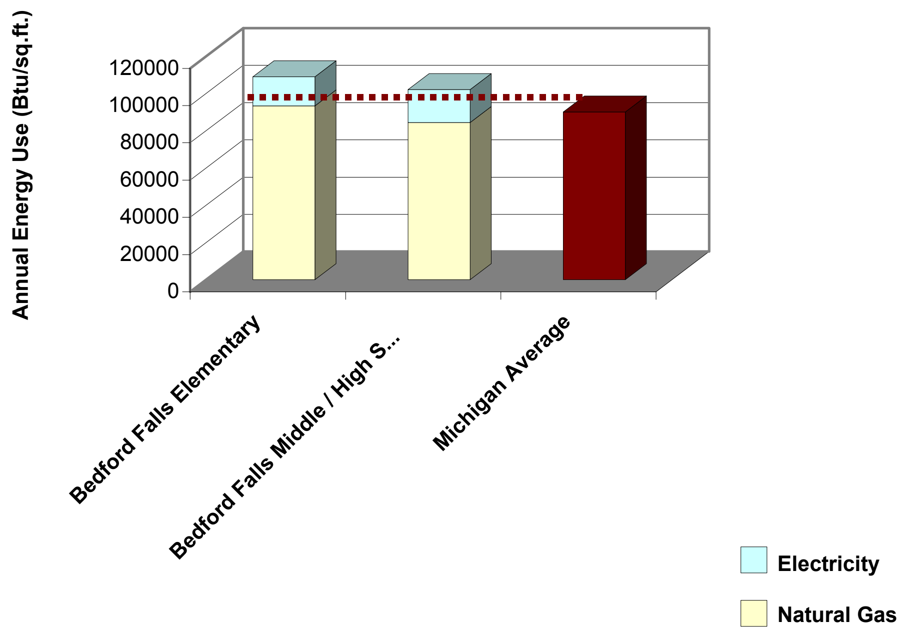
As shown in Figure 1, both of the buildings have a little higher than average energy use compared to average Michigan schools. And, as seen in Figure 2, both have a lower cost per square foot compared to the Michigan average. For this, your staff should be congratulated. Systems have been well maintained and operation is efficient.

The best news is that there is still good potential for lowering energy use and cost per square foot at all locations. While lighting upgrades, timers and control measures appear to offer the most cost-effective energy saving opportunities, there are heating and water heating system replacements and window improvements that may also be worth taking a look at.

<u>Note</u>: *The Appendix contains individual energy consumption profiles for each building.*

Energy Consumption Comparison & Benchmark

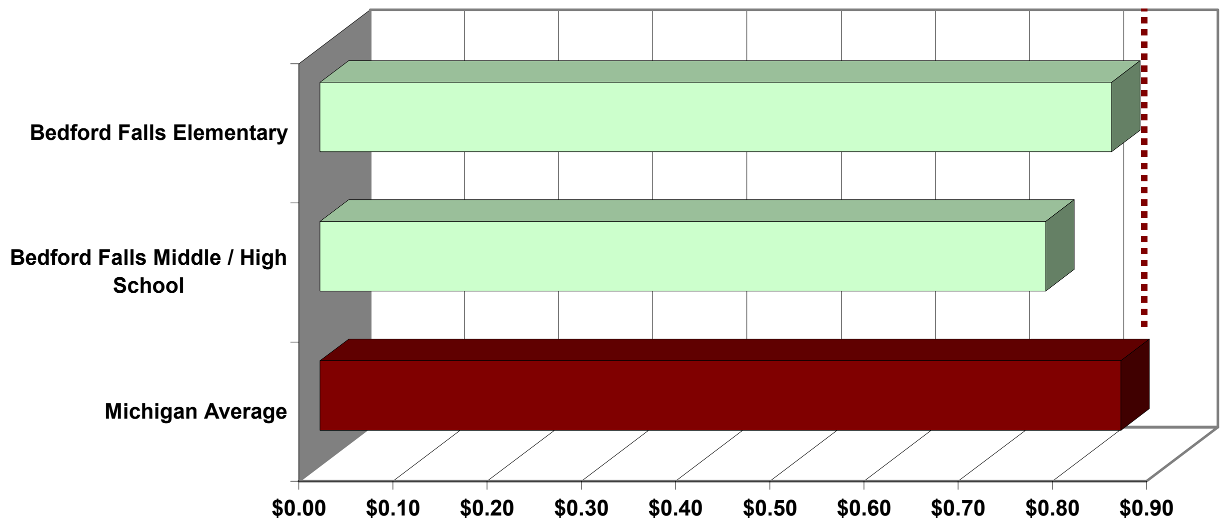
Figure 1 Energy Consumption Comparison



Name of Building	Natural Gas Use (Btu / sq.ft. / year)	Electricity Use (Btu / sq.ft. / year)	Total EUI (Btu / sq.ft. / year)
Bedford Falls Elementary	93,339	15,683	**109,022**
Bedford Falls Middle / High School	84,432	17,671	**102,103**
Michigan Average			**90,000**

Energy Cost Comparison & Benchmark

Figure 2 Annual Energy Cost per Square Foot Comparison ($ / sq.ft. /year)



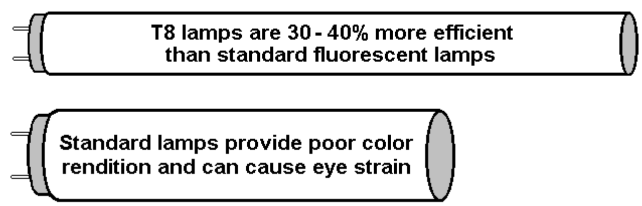
Name of Building	Natural Gas ($ / sq.ft. / year)	Electricity ($ / sq.ft. / year)	Total Cost ($ / sq.ft. / year)
Bedford Falls Elementary	$0.37	$0.47	**$0.84**
Bedford Falls Middle / High School	$0.29	$0.48	**$0.77**
Michigan Average			**$0.85**

Discussion of Energy Conservation Opportunities

The individual ECOs from the Summary of Energy Conservation Opportunities are discussed below. From experience, the energy savings for most ECOs will pay for the implementation cost in less than six years… sometimes much less. ECOs involving major building improvements (windows, doors, wall insulation, etc.), sophisticated energy management systems or HVAC system replacements will generally require an engineering study to determine cost-effectiveness.

ECO # 1 : T8 Fluorescent Lighting (with electronic ballasts)

The new T8 fluorescent lamps, powered by electronic ballasts, use *30-40% less* energy than standard T12 fluorescent lamps. T8 lamps are available in common lengths, but 4-foot T8s are most popular. Fixtures with 8-foot lamps can often be retrofitted with 4-foot lamps (end to end)… they're more stable, less expensive and have a 33% longer life than the 8-foot lamps.



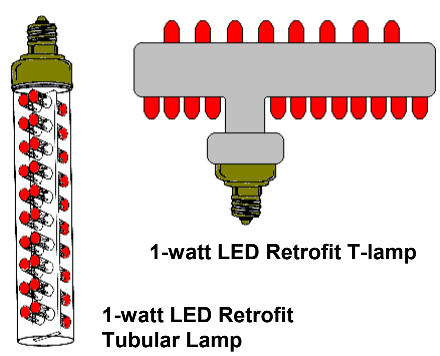
In most cases, older fixtures are replaced with new high efficiency fixtures pre-wired with T8 lamps and electronic ballasts. But when existing fixtures are in good condition, it is possible to replace just the ballast(s) and lamps.

Besides energy efficiency, T8 fluorescent lighting provides higher quality illumination. Color rendition is much improved and there is no detectable *flicker* (often exhibited by standard fluorescent fixtures). As a result, eyestrain is reduced. There are even studies showing increased productivity under T8 lighting.

At both buildings, T8 fluorescent lamps and electronic ballasts should be used to replace standard fluorescent lighting. In cases where fixtures are old and lenses have yellowed/deteriorated, entirely new fixtures or at least new lenses will be necessary.

ECO # 2 : LED Exit Sign Lighting

The development of light emitting diodes (LEDs) has allowed the replacement of exit sign lighting with a more energy efficient alternative. Multiple LEDs, properly configured, produce equivalent lighting and consume 95% less electricity than incandescent bulbs and 85% less than energy-efficient compact fluorescent lamps. A major benefit is the 20-year life cycle rating of LEDs… they virtually *eliminate* exit sign maintenance.



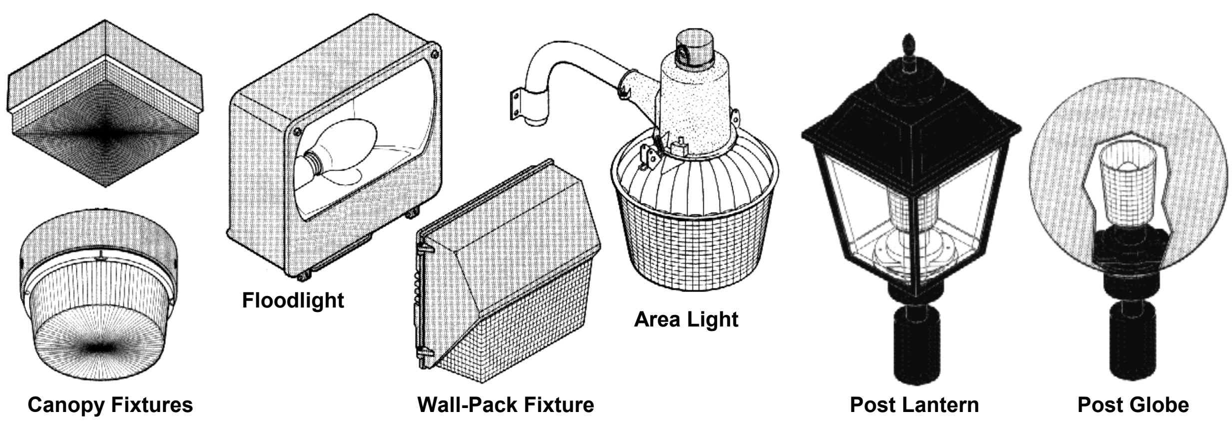
Most exit signs are lit by (2) 20-watt incandescent bulbs and can be replaced with LED retrofit lamps that draw only 1-2 watts each. These are screw-in conversions, so installation is quick and easy… rewiring the fixture is not necessary. If converting an existing exit sign is not possible, it may be cost-effective to replace it completely with a new LED exit sign fixture.

At both buildings, you should consider the replacement of incandescent exit signs with LED units. LED retrofit lamps can be used in some fixtures, while others will need to be replaced with LED exit sign fixtures. Over 90% savings can be achieved on exit sign lighting.

ECO # 3 : High Efficiency HID Exterior Lighting

High intensity discharge (HID) lighting is much more efficient and preferable to incandescent, quartz-halogen and most fluorescent light fixtures. HID types (from least to most efficient) include mercury vapor, metal halide and high pressure sodium. Mercury vapor is seldom used anymore. Both metal halide and high pressure sodium are excellent outdoor lighting systems. High pressure sodium has a pink-orange glow and is used when good color rendition isn't critical. Metal halide, though less efficient, provides clean white light and good color rendition.

HID lighting is mostly utilized in floodlight, wall pack, canopy, post lantern and area fixtures outdoors. The best type for any application depends on the area being lit and mounting options.

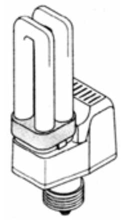


At both buildings, consider the replacement of mercury vapor fixtures with high pressure sodium fixtures to save 35% on exterior lighting.

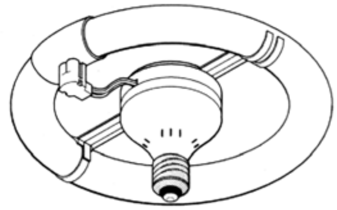
ECO # 4 : Compact Fluorescent Lamps (CFLs)

The compact fluorescent lamp (CFL) is an energy efficient alternative to incandescent lighting. CFLs provide equivalent lighting, consume 75-80% *less* energy and last 5 to 15 times *longer* than incandescent lamps. At one time, the application of a CFL was somewhat limited… mainly the replacement of a 60-watt light bulb on a non-dimming circuit. Now there are many types of CFLs available for a wider variety of purposes. Improvements in ballast technology have enabled CFL use outdoors in cold weather and with dimmers, too (but only as specified). They're also available in smaller sizes, and several shapes have been developed to provide more versatility.

CFL design is *modular* or *integral*. Sometimes called a *2-piece* CFL, the modular design has a separate lamp and screw-in ballast base. Only the lamp is replaced on burnout… the screw-in ballast base has a longer life and will usually last through five (or more) lamp changes.

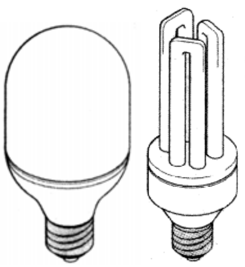


Modular CFL

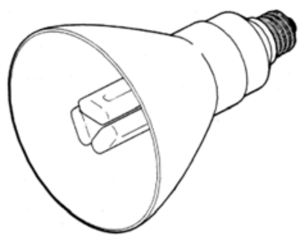


Modular Circline CFL

Modular CFL R-Lamp



Integral CFLs



Integral CFL R-Lamp

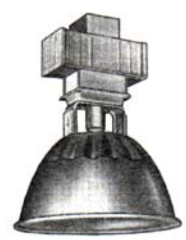
An integral CFL is a one-piece *throwaway* unit... the entire unit is replaced when it burns out. Since there is very little up-front cost difference between integral and modular CFLs, the modular design is more cost-effective because new lamps run *50-90% less* than the cost to replace the entire CFL unit.

At both buildings, where incandescent lighting cannot be replaced with T8 fluorescent fixtures, consider using compact fluorescent lamps.

ECO # 5 : Pulse-Start Metal Halide Lighting

Metal halide lighting is more efficient and preferable to incandescent, mercury vapor and most fluorescent light fixtures for large spaces with high ceilings… gymnasiums, multipurpose rooms, swimming pool areas, etc. The new *pulse-start* technology has produced several improvements over standard metal halide lighting. Light output and lamp life have been increased by 10-30%, light levels are maintained more consistently over time, and the quality of the clean, white light has also been improved. As a result, pulse-start metal halide lighting saves energy and provides higher quality illumination than most other sources (including standard metal halide fixtures).

Pulse-start metal halide fixtures are primarily available in *high bay* or *low bay* designs. High bay fixtures deliver a bright, concentrated light beam and are recommended for mounting heights over 20 feet. Below this height, they may cause glare, shadows and eyestrain. Low bay fixtures provide more diffuse, even lighting… a better choice for mounting heights under 20 feet.



High Bay Fixture

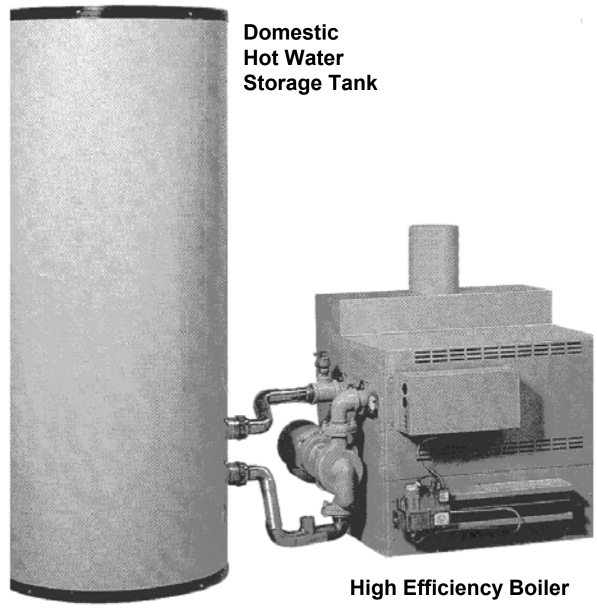
Low Bay Fixture

Fixture replacement is not always necessary… existing fixtures in good condition can often be retrofitted with pulse-start ballast and lamp kits. At the Middle / High School building, consider replacing the old incandescent gymnasium lighting with pulse-start metal halide fixtures.

ECO # 6 : Water Heating System Replacements

A modular water heating system is made up of several components, as shown below. A high efficiency boiler is utilized to heat the water, increasing efficiency by more than 30% over conventional water heaters.

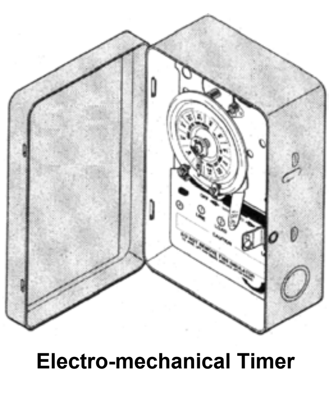
Separating the storage tank from the boiler offers several advantages. The heating coil is located *inside* the storage tank, so more evenly heated water is produced; with a conventional system, the burner is located *below* the tank, which can cause temperature stratification (uneven heating). Conventional water heaters lose up to 25% efficiency over time as sediment builds up on the bottom of the tank... the burner has to fire longer to heat the water. This also diminishes its capacity (gallons of hot water readily available), since it can no longer heat water as fast. With a modular water heating system, the coil inside the tank and *above* the sediment build-up can heat a large volume of water very quickly. Routine maintenance can *sustain* efficiency over its life.



At both buildings, consider replacement of the well-oversized modular water heating systems with smaller modular systems. The Elementary could probably be adequately served by just an 80-gallon commercial water heater.

ECO # 7 : Timers for Water Heating Circulator Pumps

Circulator pumps regularly operate twenty-four hours a day and the water heating system has to cycle more frequently to maintain temperature. Shutting down circulator pumps overnight or whenever the building is unoccupied (for at least 6 hours) is recommended. Electricity savings are gained by shutting down the pump, but over 50% of the *total* savings is directly due to reduced water heater cycling.



Electro-mechanical Timer

Electro-mechanical timers are the typical choice for controlling hot water circulator pumps. They do, however, need to be hard-wired into the circuit. If the pump plugs directly into a wall outlet, a lower cost option is a 24-hour plug-in timer. Either way, the savings will usually justify the cost.

At both buildings, install electro-mechanical timers on the circulator pumps to shut off the water heating loops during unoccupied building hours.

ECO # 8 : Water Conservation

To conserve water in schools or public buildings with older bathroom facilities, low flow or water use reduction kits can be installed in toilet and urinal flush valves. Low flow kits reduce the amount of water required to flush a typical toilet or urinal by 1-2.5 gallons per flush. The kits are inexpensive (less than $25) and available at most plumbing supply companies. This measure would be appropriate for both buildings.

ECO # 9 : Steam Trap Maintenance

A steam system has steam traps to remove air, carbon dioxide and condensate from the pipe distribution system while holding in the useful steam to heat the building. A failed trap can block steam distribution to some areas of the system and cause severe heating problems (lack of heat in these areas). Or, it could allow steam to pass through the system without releasing its full heating potential. This can cause overheating in building areas the return steam lines pass through; occupants may try to correct this by opening windows (not a desirable situation in the middle of the winter). Either situation will reduce the overall efficiency of the heating system and increase energy costs.

National surveys estimate that 15-60% of the steam traps now in use have failed. For this reason, annual testing of steam traps by a licensed HVAC contractor/technician is recommended and is usually very cost effective. Detection and replacement cost of one failed trap can pay for itself in energy savings in a matter of months.

Inspection and repair/replacement of any faulty steam traps in the boiler system at both buildings is strongly encouraged.

ECO # 10 : Tune / Calibrate or Replace Pneumatic System

The heating system at both buildings utilizes radiators and cabinet heaters to distribute heat, managed by a pneumatic temperature control system. Significant energy efficiency gains can often be made by tuning and calibrating (if necessary) this type of system, especially if any air leaks are present. A tune-up by qualified HVAC technicians is almost always a cost-effective measure to implement every few years.

ECO # 11 : Energy Management System (EMS)

There is a wide variety of EMS equipment on the market. Basic models are available that control building temperatures and the heating, ventilation and air conditioning (HVAC) system. More advanced EMS units can control and monitor most (or all) of the energy systems operating in the building and provide computer printouts of unlimited options regarding the energy usage by each system. Many of the basic EMS models can often be upgraded with various *modules* to offer more extensive control of building energy systems if this becomes necessary.

Consider installation of an EMS at both buildings to provide better control of the heating systems and building temperatures; implement day-night temperature control for significant savings.

ECO # 12 : Steam Boiler Replacement

Due to recent developments, it may be worth considering replacement of the existing steam boiler system at both buildings with a new high efficiency system. Boilers are rated according to thermal efficiency, a measurement of usable heat provided under standard operating conditions. For example, most *well-maintained* boilers have a thermal efficiency between 70-75%… of the fuel burned, 70-75% can be converted to space heat while 25-30% is lost up the chimney. Older system efficiencies can drop off to 60% or less. With some models having efficiencies as high as 85%, a substantial savings may be possible with one of these new steam boilers.

The existing boiler systems may also be oversized. With energy conservation measures being gradually implemented over time, the current heating loads are less than what they used to be. As a result, the boiler systems may only be required for short, periodic bursts with long intervals in between, further reducing system efficiency. New models can be properly sized to provide optimum heating efficiency.

At both buildings, consider replacing the boilers with properly sized high efficiency systems.

ECO # 13 : Upgrade Single-Pane Windows

Older single-pane windows can be a major source of heat loss and air leakage, and can greatly impact the heating load on a building. A detailed engineering study is generally required to determine the best way to upgrade single-pane windows. Several options are discussed below.

- ***Replace the window area*:** New windows with multiple glazings can be costly. While some models include specialized coatings to improve performance and increase energy savings, this option is generally the most expensive.
- ***Reduce the window area*:** Windows can be removed and replaced with an insulated wall section. Overglazing, a translucent insulated panel that is installed over the window, can be used as an alternative if natural lighting is preferred. Either way, smaller and more efficient windows can be added to the remodeled wall section for visibility, if necessary.
- ***Add moveable insulation to the window area*:** Quilted shades (*window quilts*) or sliding insulated shutters (*snuffer panels*) are viable alternatives to replacing or reducing window areas. For schools in particular, snuffer panels offer some additional benefits... they are very effective in darkening a classroom for multimedia presentations and can be utilized as additional bulletin-board area. For a low cost alternative, sheets of rigid insulation board can be sized to fit window openings and put in place when necessary. Window insulation should be used overnight and any time the building is unoccupied.

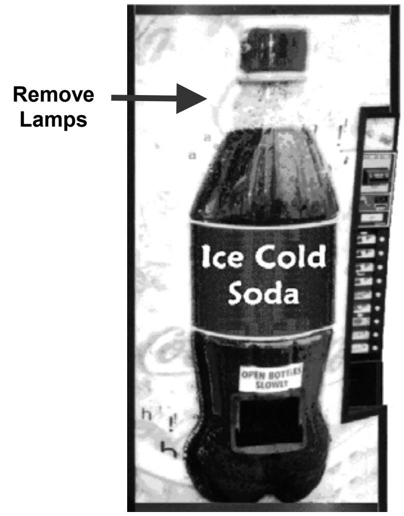
<u>*Both*</u> buildings have single-pane glass windows. These single-pane window areas could be reduced *or* replaced. Any of the options listed above would be beneficial and could be paid for with energy savings. Due to the cost of implementation and complexity of analysis, the best option for your situation should be determined by a detailed engineering study.

ECO # 14 : Upgrade Pop Machines

Refrigerated pop machines operate 24 hours/day, usually with display lighting that also operates continuously. The lighting produces heat which adds to the load on the compressor, increasing refrigeration cost. Some machines have *two or more* fluorescent lamps; simply disconnecting the ballast and lamps, can save up to $100 per year!

> *NOTE: Vendors should be consulted before this measure is implemented. It is best if they remove the lamps and disconnect the ballasts themselves.*

At both buildings, disconnect the lamps and ballasts inside the pop machines. (Check with your vendor first).

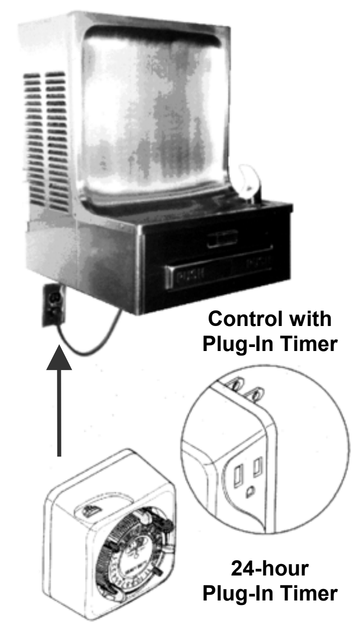


ECO # 15 : Drinking Fountain Timers

Drinking fountains are often refrigerated types that keep chilled water available on a continuous basis. Overnight or during periods the building is unoccupied, the drinking fountain can be turned off (chilling of water during winter months is often unnecessary, too). Because a drinking fountain can cost as much to operate as a small refrigerator, the savings potential for turning it off when possible makes this a measure worth considering.

Short of shutting off power to the drinking fountain permanently, the best option is to install a timer to automatically control the hours of operation to coincide with building hours. An inexpensive 24-hour *plug-in timer* can be installed if a drinking fountain is the plug-in type.

Consider this for the plug-in drinking fountains at both buildings.



ECO # 16 : ENERGY STAR Computers & Power-Down Feature

Energy costs associated with electrical plug loads should be minimized where possible. Plug loads include computer equipment and other electrical devices, which are plugged into the building's electrical system. These loads include incidental equipment such as computers, printers, fax machines and copiers. The majority of computers manufactured in the past five years have *power-down* capability, which usually needs to be activated… all computers purchased in the last five years should be checked for this feature and activated, if necessary. When purchasing computer equipment, the U.S. EPA ENERGY STAR standards should be specified. Upon delivery of the equipment, the power-down feature should be activated.

ECO (Future) : Roof Insulation

Since warm air rises, it is important to make sure the roof area is adequately insulated. Methods of application include:

- ***Interior Roof Insulation*****:** In some buildings, the insulation can be applied directly to the underside of the roof structure. If the structure is wood frame, insulation (rigid or blanket) can be placed between roof joists. For metal roofs, foams or mineral fiber can be sprayed onto the roof surface underside.
- ***Sprayed On Foam*****:** This type of insulation is applied to the exterior roof surface (usually metal). A thin protective coating is then added to act as a weather shield.
- ***Rigid Insulation w/ New Roof*****:** When the existing roof needs to be replaced, it would be wise to install two-inches (minimum) of rigid foam beneath the new membrane. Due to the expense, this method is rarely considered until re-roofing is necessary.

When roof replacement is due, be sure to specify installation of at least two-inches of rigid foam beneath the new roof membrane. It appears that this needs to be considered soon at the Middle and High School building. For the Elementary, remember that additional insulation at the time of roof replacement is almost always a wise investment.

ECO (Future) : Premium Efficiency Motors

Using better quality steel, larger conductors with lower electrical resistance, improved bearings and low-loss fan designs, the new premium efficiency motors can save up to 10% over standard models. If existing motors are old or poorly maintained (or both), the savings can be greater.

Motors need to be properly sized for maximum efficiency. When considering replacement, it is important to make sure that the new motor is sized correctly for the job. A motor that is too large for the task at hand will be inefficient and more costly to operate.

Finally, premium efficiency motors have higher power factors. This is especially important when trying to prevent penalty charges (due to low power factor) from being assessed on your electric bill. Correcting power factor is also an easier task when equipment, like a premium efficiency motor, has a higher rating to begin with.

When replacing pump, air handler fan or other motors, be sure to specify premium efficiency motors. Any additional expense will be recovered quickly in energy savings.

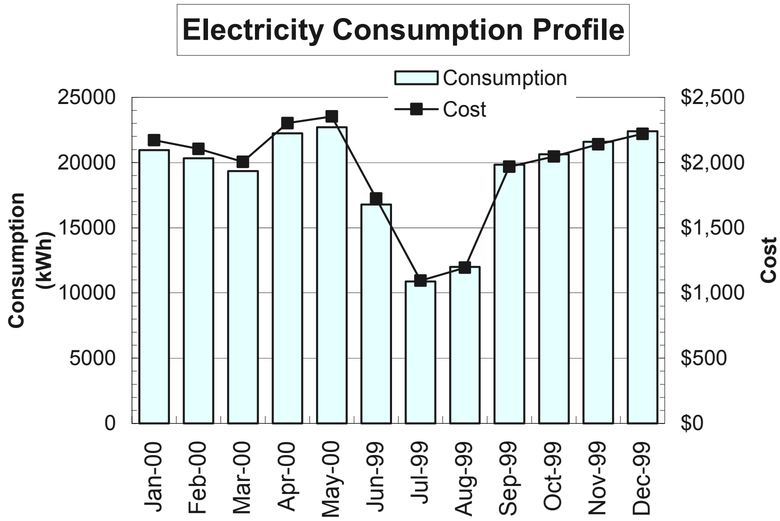
Appendix: Energy Consumption Profiles

Bedford Falls Elementary School……….page 19
Bedford Falls Middle / High School……….page 20

Bedford Falls Elementary

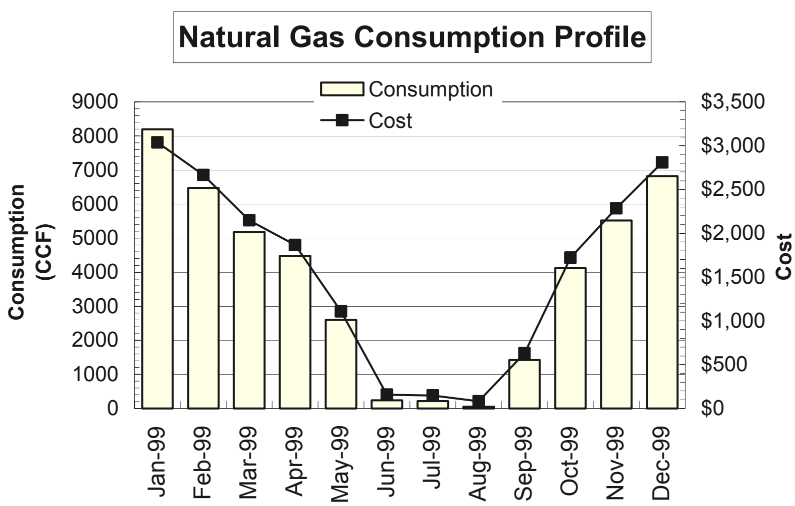
789 Main Street, Bedford Falls MI

Building Area:
50,000
square feet



Month	kWh	Cost
Jan-00	20,960	$2,171
Feb-00	20,320	$2,105
Mar-00	19,360	$2,006
Apr-00	22,240	$2,304
May-00	22,720	$2,353
Jun-99	16,800	$1,724
Jul-99	10,880	$1,094
Aug-99	12,000	$1,194
Sep-99	19,840	$1,967
Oct-99	20,640	$2,046
Nov-99	21,600	$2,141
Dec-99	22,400	$2,220
Totals:	**229,760**	**$23,327**

Cost/sq.ft.: $0.47 per sq.ft./yr.
Elec EUI: 15,683 BTU/sq.ft.
Avg. Cost: $0.102 /kWh



Month	CCF	Cost
Jan-99	8,190	$3,039
Feb-99	6,470	$2,667
Mar-99	5,180	$2,147
Apr-99	4,480	$1,865
May-99	2,600	$1,108
Jun-99	240	$157
Jul-99	220	$149
Aug-99	50	$80
Sep-99	1,420	$632
Oct-99	4,120	$1,720
Nov-99	5,520	$2,284
Dec-99	6,820	$2,808
Totals:	**45,310**	**$18,656**

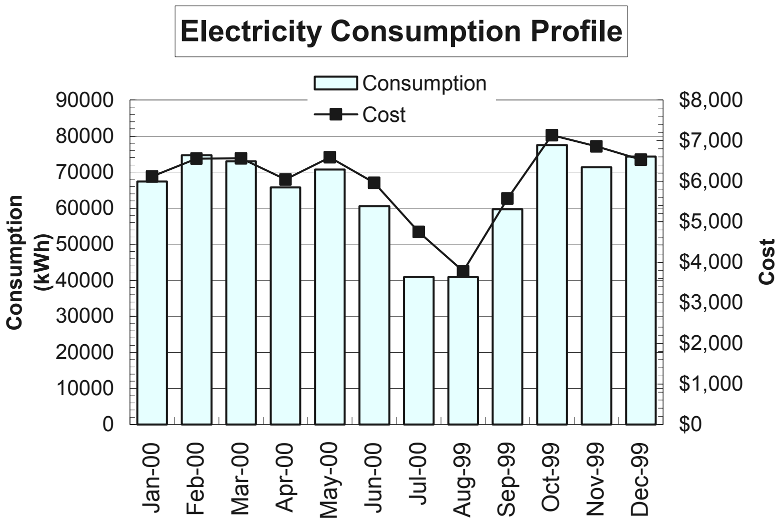
Cost/sq.ft.: $0.37 per sq.ft./yr.
Gas EUI: 93,339 BTU/sq.ft.
Avg. Cost: $0.412 / CCF

Annual Utility Cost = $41,983
Total Cost / sq.ft. = $0.84
Combined EUI = 109,022

Bedford Falls Middle / High School

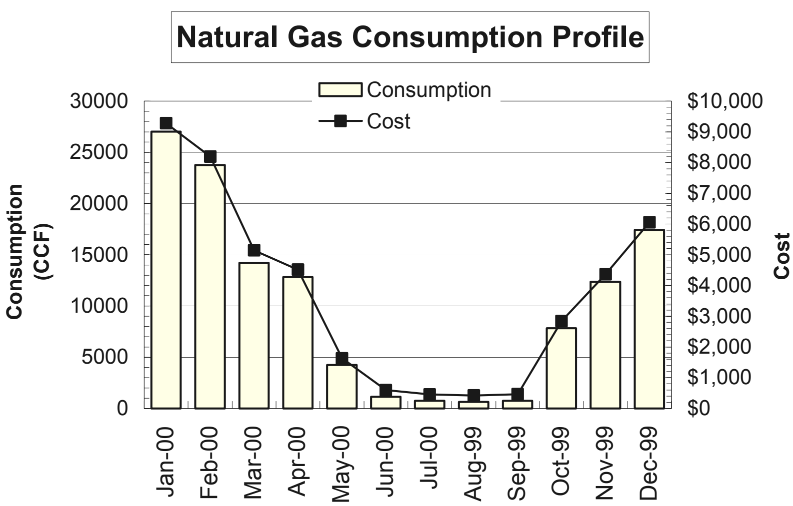
456 Main Street, Bedford Falls MI

Building Area:
150,000
square feet



Month	kWh	Cost
Jan-00	67,360	$6,118
Feb-00	74,640	$6,557
Mar-00	72,960	$6,561
Apr-00	65,760	$6,039
May-00	70,720	$6,585
Jun-00	60,560	$5,957
Jul-00	40,880	$4,748
Aug-99	40,880	$3,781
Sep-99	59,680	$5,571
Oct-99	77,520	$7,136
Nov-99	71,360	$6,859
Dec-99	74,320	$6,533
Totals:	**776,640**	**$72,446**

Cost/sq.ft.: $0.48 per sq.ft./yr.
Elec EUI: 17,671 BTU/sq.ft.
Avg. Cost: $0.093 /kWh



Month	CCF	Cost
Jan-00	27,010	$9,278
Feb-00	23,770	$8,190
Mar-00	14,218	$5,147
Apr-00	12,814	$4,512
May-00	4,247	$1,636
Jun-00	1,142	$593
Jul-00	741	$459
Aug-99	636	$424
Sep-99	750	$462
Oct-99	7,837	$2,841
Nov-99	12,371	$4,363
Dec-99	17,423	$6,059
Totals:	**122,959**	**$43,965**

Cost/sq.ft.: $0.29 per sq.ft./yr.
Gas EUI: 84,432 BTU/sq.ft.
Avg. Cost: $0.358 / CCF

Annual Utility Cost = $116,411
Total Cost / sq.ft. = $0.78
Combined EUI = 102,103